



The Metropolitan

*Water Reclamation District*

of Greater Chicago

**WELCOME  
TO THE OCTOBER EDITION  
OF THE 2016  
M&R SEMINAR SERIES**

# BEFORE WE BEGIN

- **SAFETY PRECAUTIONS**
  - PLEASE FOLLOW EXIT SIGN IN CASE OF EMERGENCY EVALUATION
  - AUTOMATED EXTERNAL DEFIBRILLATOR (AED) LOCATED OUTSIDE
- **PLEASE SILENCE CELL PHONES OR SMART PHONES**
- **QUESTION AND ANSWER SESSION WILL FOLLOW PRESENTATION**
- **PLEASE FILL EVALUATION FORM**
- **SEMINAR SLIDES WILL BE POSTED ON MWRD WEBSITE** ([www.MWRD.org](http://www.MWRD.org): Home Page ⇒ Reports ⇒ M&R Data and Reports ⇒ M&R Seminar Series ⇒ 2016 Seminar Series)
- **STREAM VIDEO WILL BE AVAILABLE ON MWRD WEBSITE** ([www.MWRD.org](http://www.MWRD.org): Home Page ⇒ MWRDGC RSS Feeds)

# Daniel E. Collins, P.E.

***Current:*** Managing Civil Engineer, M&O Department, Metropolitan Water Reclamation District of Greater Chicago (MWRD)

***Experience:*** Biosolids manager, EMS coordinator, Biosolids Task Force Leader, MWRD  
Led District EMS Certification in 2008  
Principal Civil Engineer, Section head of LASMA Biosolids Management  
Senior Civil Engineer, Acting Section Head of Solids Management, CWRP  
Associate Civil Engineer, CWRP Biosolids Drying Facility Manager  
Assistant Civil Engineer, M&O Biosolids Management, MWRD

***Education:*** Bachelor of Science in Mechanical Engineering, Purdue University, Indiana

***Professional:*** WEF: National Biosolids Partnership Advisory Committee Vice Chair Residuals & Biosolids Committee, Sustainability Sub-Committee  
IWEA – President Elect and Biosolids Committee  
NACWA – Biosolids Management Committee

# Guanglong Tian, Ph.D.

- Current:** Provisional Supervising Environmental Soil Scientist, M&R Dept, Metropolitan Water Reclamation District of Greater Chicago (MWRD)
- Experience:** Manage Biosolids Utilization and Soil Science Section, and MWRD's Fulton County Nutrient Loss Reduction studies  
Senior Environmental Soil Scientist and Soil Scientist I, MWRD  
Visiting Soil Ecologist (Adjunct Faculty), Institute of Ecology, Univ. of Georgia  
Scientist (Section Head)/Associate Scientist/Postdoctoral Fellow International Institute of Tropical Agriculture, Ibadan, Nigeria
- Education:** Ph.D. in Soil Biology/Soil Fertility, Wageningen Agricultural University, The Netherlands  
**M.S. in** Soil Geography, Chinese Academy of Sciences, China  
**B.S. in** Soil Science/Agrochemistry, Sichuan Agricultural University, China
- Professional:** Subject Editor of Soil Biology and Biochemistry (2001 - 2007)  
Committee of Agricultural Soil CO<sub>2</sub> Expert Group of Intergovernmental Panel on Climate Change  
USDA Biosolids Committee (W3170)
- Award:** Recipient of the Soil Science Society of America's 1999 Young Scholar Award

Biosolids Composting and  
Class A Biosolids Product Utilization  
at the Metropolitan Water Reclamation  
District of Greater Chicago

Dan Collins

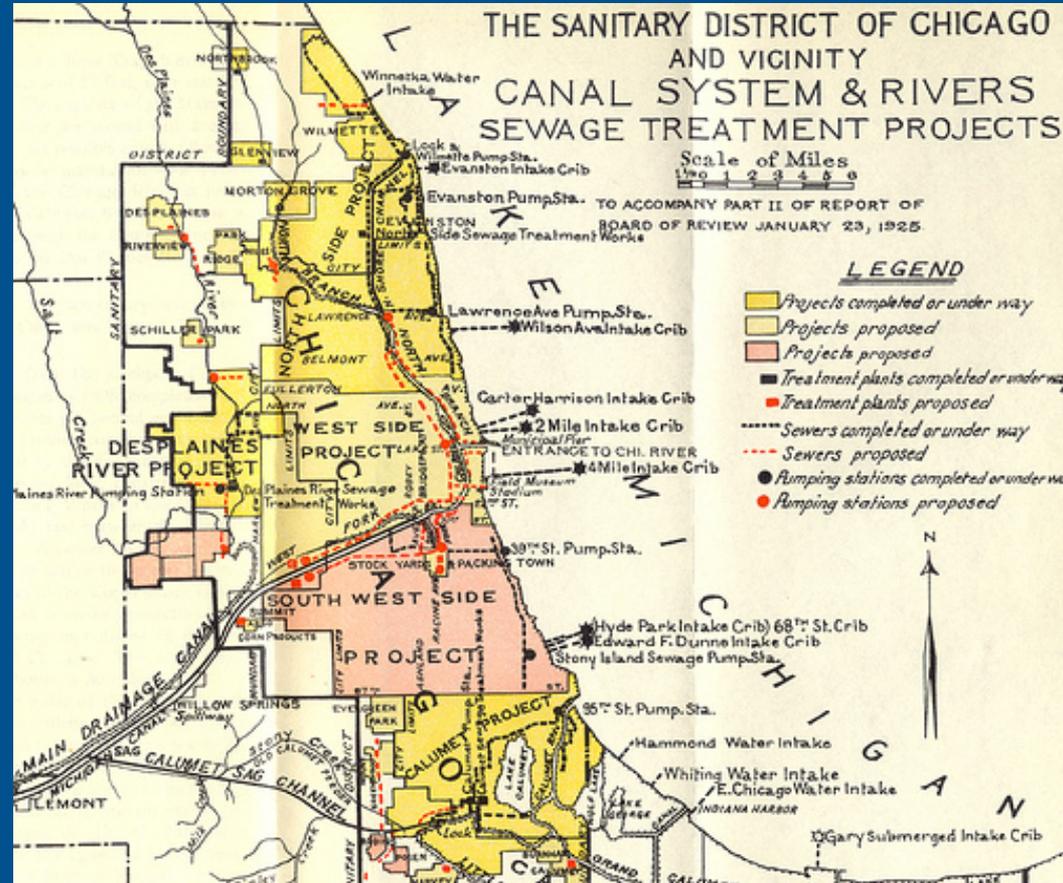
Guanglong Tian

# MWRDGC – Wastewater

Government Agency Created in 1889 to protect the waters of Lake Michigan

Approximately one-half of the sewage treatment capacity for the state of Illinois

1.5 Billion Gallons of Wastewater per day



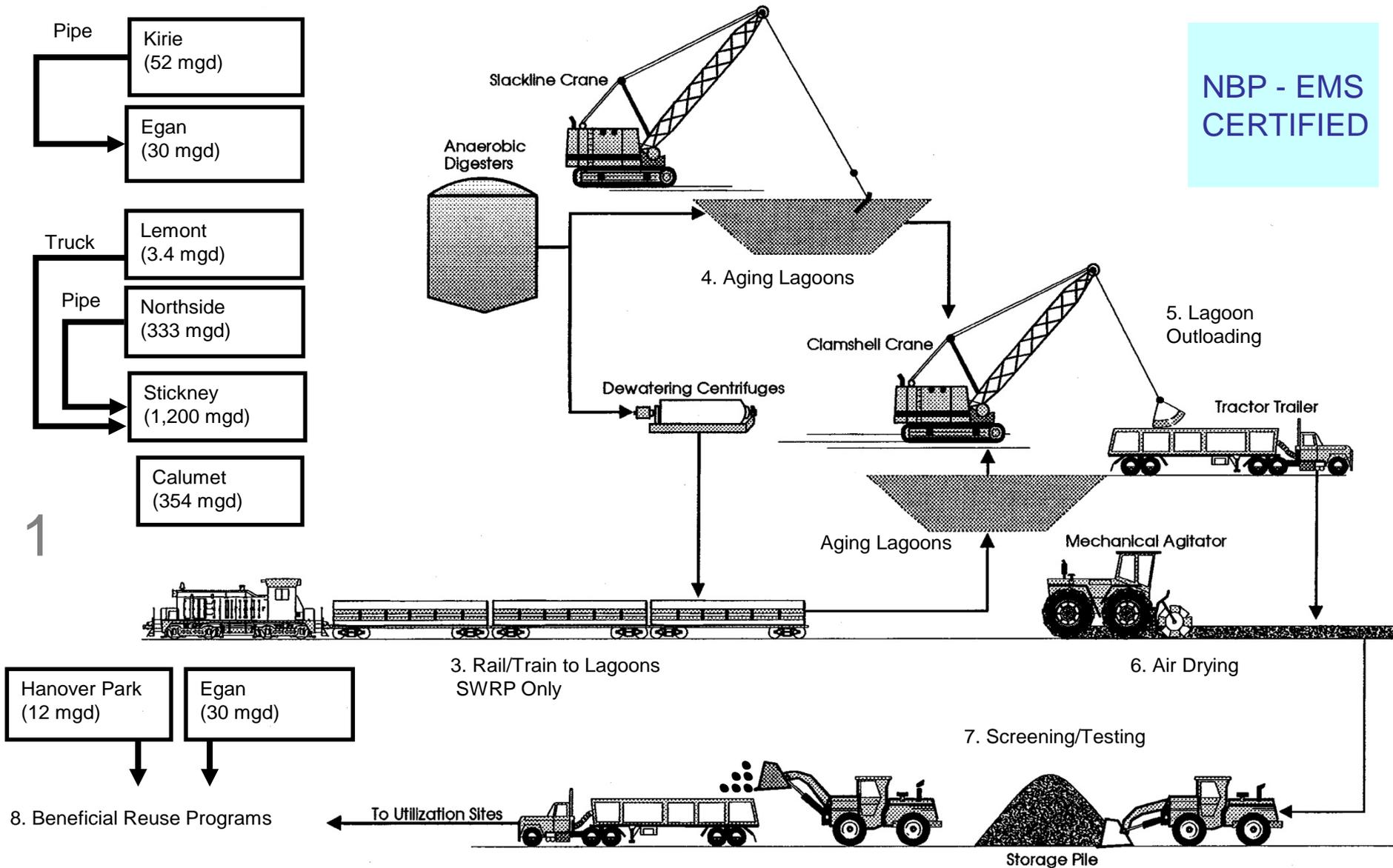
# MWRDGC - Biosolids

The District generates approximately 140,000 DT of biosolids for utilization every year.

Biosolids are processed for at 4 WRPs:

	<u>Amount Utilized/Year (DT)</u>
Stickney	110,000
Calumet	22,500
John E. Egan	6,500
Hanover Park	1,000

NBP - EMS  
CERTIFIED



# SOLIDS HANDLING AND PROCESSING SCHEMATIC



# Biosolids are Regulated at the Federal Level

Trace Metal	Part 503 Allowable	Exceptional Quality	MWRD Biosolids
	----- mg/kg -----		
Arsenic	75	41	5
Cadmium	85	39	3
Copper†	4,300	1,500	380
Mercury	57	17	1
Molybdenum †	75	---	10
Nickel †	420	420	40
Lead	840	300	100
Selenium †	100	100	5
Zinc †	7,500	2,800	725

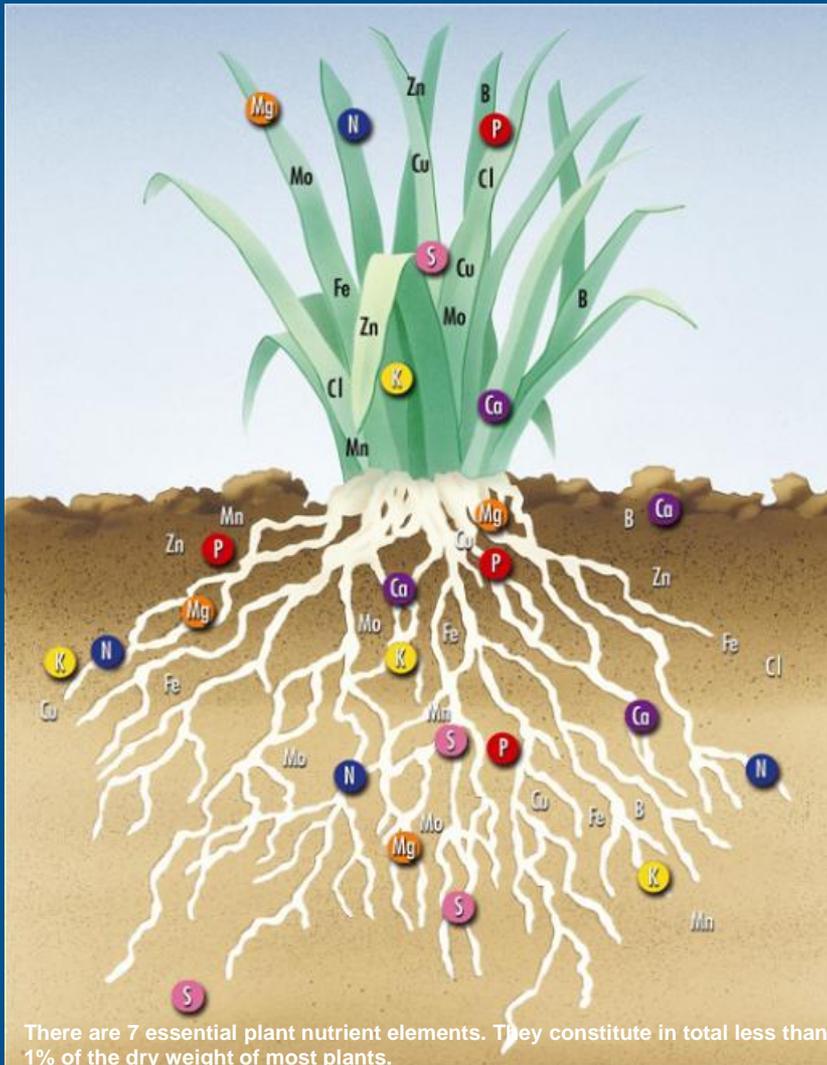
# Recent Changes to IL Regulations (Public Act 099-0067)

- Passed in July 2015, adopting USEPA Part 503 EQ Standard in Illinois
- States that Exceptional Quality biosolids can “be used on land as a beneficial recyclable material that improves soil tilth, fertility, and stability...”
- And that Exceptional Quality biosolids are “a resource to be recovered...”
- But most importantly, “to encourage and promote the use of Exceptional Quality biosolids in productive and beneficial applications, to the extent allowed by federal law, Exceptional Quality biosolids shall not be subject to regulation as a sludge or other waste...”
- Allows for nearly unrestricted distribution of biosolids.

# History of Biosolids Use

-  Landfills
-  NU Earth
-  Fulton County Land Reclamation (over 1 million tons used)
-  Land Application on Farmland
-  Controlled Solids Distribution

# Biosolids: Soil Multi-Vitamin



## Essential Elements

- Major Nutrient
  - Nitrogen (N)
  - Phosphorous (P)
  - Potassium (K)
- Minor Nutrient
  - Calcium (Ca)
  - Magnesium (Mg)
  - Sulfur (S)
- Micro- Nutrient
  - Iron (Fe)
  - Manganese (Mn)
  - Boron (B)
  - Chlorine (Cl)
  - Zinc (Zn)
  - Copper (Cu)
  - Molybdenum (Mo)

# Current MWRDGC Biosolids Beneficial Reuse Programs

-  Fertilizer on farmland (up to 60% of production)
-  Substitute for soil on landfill - Final Cover
-  Fertilizer and soil amendment in the Chicago metro area  
(Controlled Solids Distribution/District Utilization)

# How and Where are MWRD Class A Biosolids Utilized in the Chicago Metro Area?

# 20+-year Class A Utilization of Biosolids in Chicagoland

Over 100 users including:

- 🌿 Golf courses
- 🌿 School Athletic fields
- 🌿 Park Districts
- 🌿 Sport facilities



# MWRD Biosolids Good for Cook County



MWRD biosolids are used for parks, sports fields, golf courses and landscaping throughout Cook County.

A valuable resource recovered by the MWRD's wastewater treatment process, biosolids are a sustainable and effective alternative to chemical fertilizers. From the scenic riverwalk in downtown Chicago to grassy neighborhood parks, biosolids help make Cook County green.

 MWRD biosolids application site  
 MWRD area

North  
 5 miles



# Cinder Ridge Golf Course





Water's Edge Golf Course

# Biosolids for Turf Maintenance

## Coyote Run Golf Course

### Why use biosolids?

- Slow release of nutrients
- Reduced use of pesticides/fungicides
- Improved water holding capacity of soil, reducing irrigation needs



# Biosolids for Putting Green Root zone

At NSCC, Glenview, 10+ types of soil conditioners, including biosolids, were used for constructing a root zone in for a putting green according to USGA specifications.

The turf area consisting of biosolids as the root zone amendment had superior performance at all times compared to the other amendments.

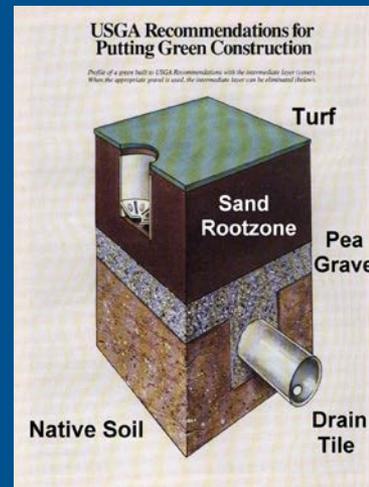


Photo: Courtesy of F. Dan Dinelli

# Oak Forest High School – Football Field



**Just seeded and  
applied biosolids**

**Two months later!**



-  Save thousands of dollars in fertilizer costs
-  Improved soil
-  Support green initiatives



# Lessons Learned

- Disadvantages:
  - Not a pellet (Particle Size Varies)
  - Process is Land intensive
  - Weather Dependent
  - High Use Periods are early/late in the year.
  - No storage of product
  - Mishandling by end users!
  - Odorous if stockpiled!

# District's Strategic Goals

- Reduce/eliminate odors due to current biosolids drying and handling procedures
- Reduce Transportation Costs
- Create readily available end-use products independent of weather variation
- Reduce operational land requirement (Carbon Footprint)
- Increase adoption of Controlled Solids Distribution program within Cook County
- Ensure financial/environmental sustainability of the program

## Annual metrics

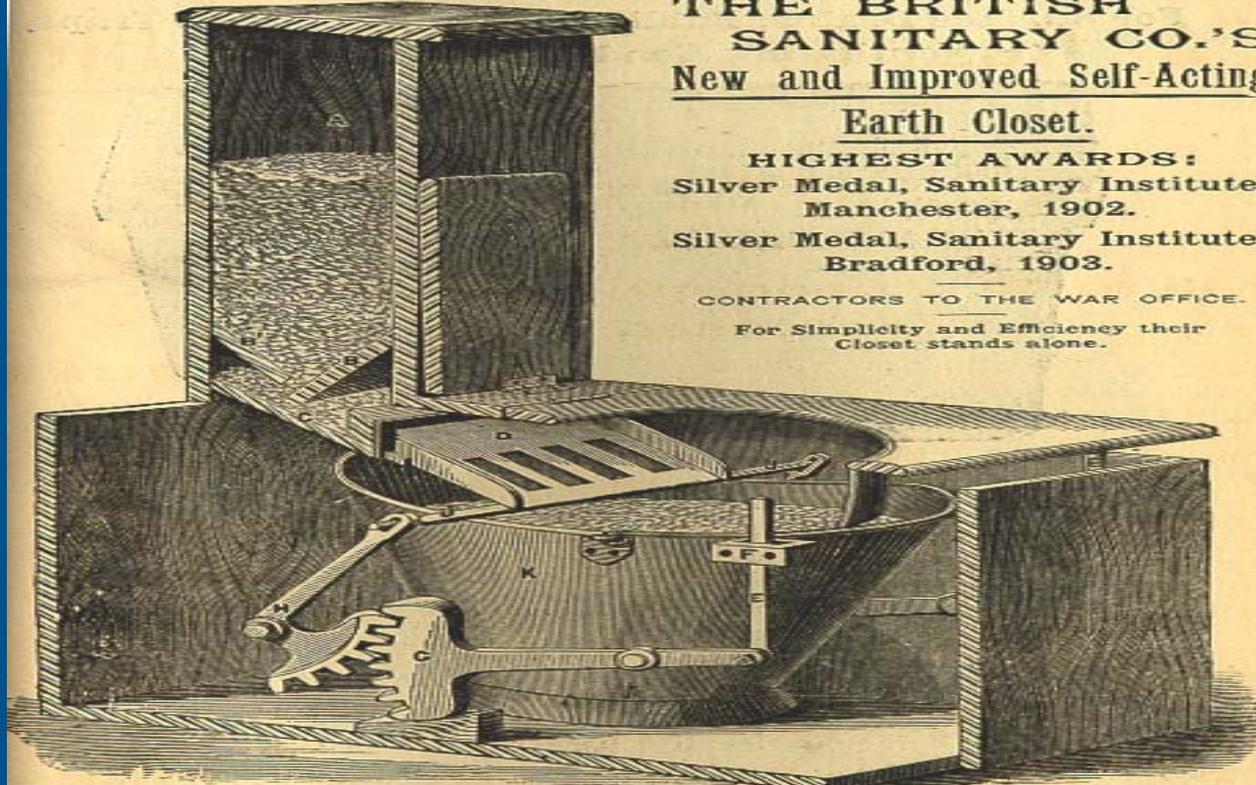
- 2017: 70% local utilization – CSD
- 2018: 100% local utilization – CSD

# Composting Can Help Meet Strategic Goals

-  Produces a Class A material efficiently and consistently
-  Reduces odor during solids management operations
-  Produces an odor free final product
-  Reduces overall operation costs
-  Produces value-added/marketable product with a potential revenue stream
-  Reduces operational footprint

# History of Composting!

## EARTH CLOSETS.



THE BRITISH  
SANITARY CO.'S  
New and Improved Self-Acting  
Earth Closet.

HIGHEST AWARDS:  
Silver Medal, Sanitary Institute,  
Manchester, 1902.  
Silver Medal, Sanitary Institute,  
Bradford, 1903.

CONTRACTORS TO THE WAR OFFICE.

For Simplicity and Efficiency their  
Closet stands alone.

Price List and full Particulars sent on application to

**THE BRITISH SANITARY CO.,**

341 BATH LANE (at Charing Cross Station).

**North Street, GLASGOW.**

STAND NO. 41.

# Product from Biosolids-Woodchips Composting



# Composted Biosolids Function and Utilization

Use Function	Brown Field Restoration	Turf Maintenance	Highway Edge Revegetation	Planting Bed	Raised Garden/ Indoor Plant
Fertilizer	✓	✓	✓	✓	✓
Soil amendment	✓	✓		✓	
Mulch			✓	✓	
Growth media				✓	✓
Disease suppression		✓			



**Mix Composted biosolids:Soil at 1:3 ratio**

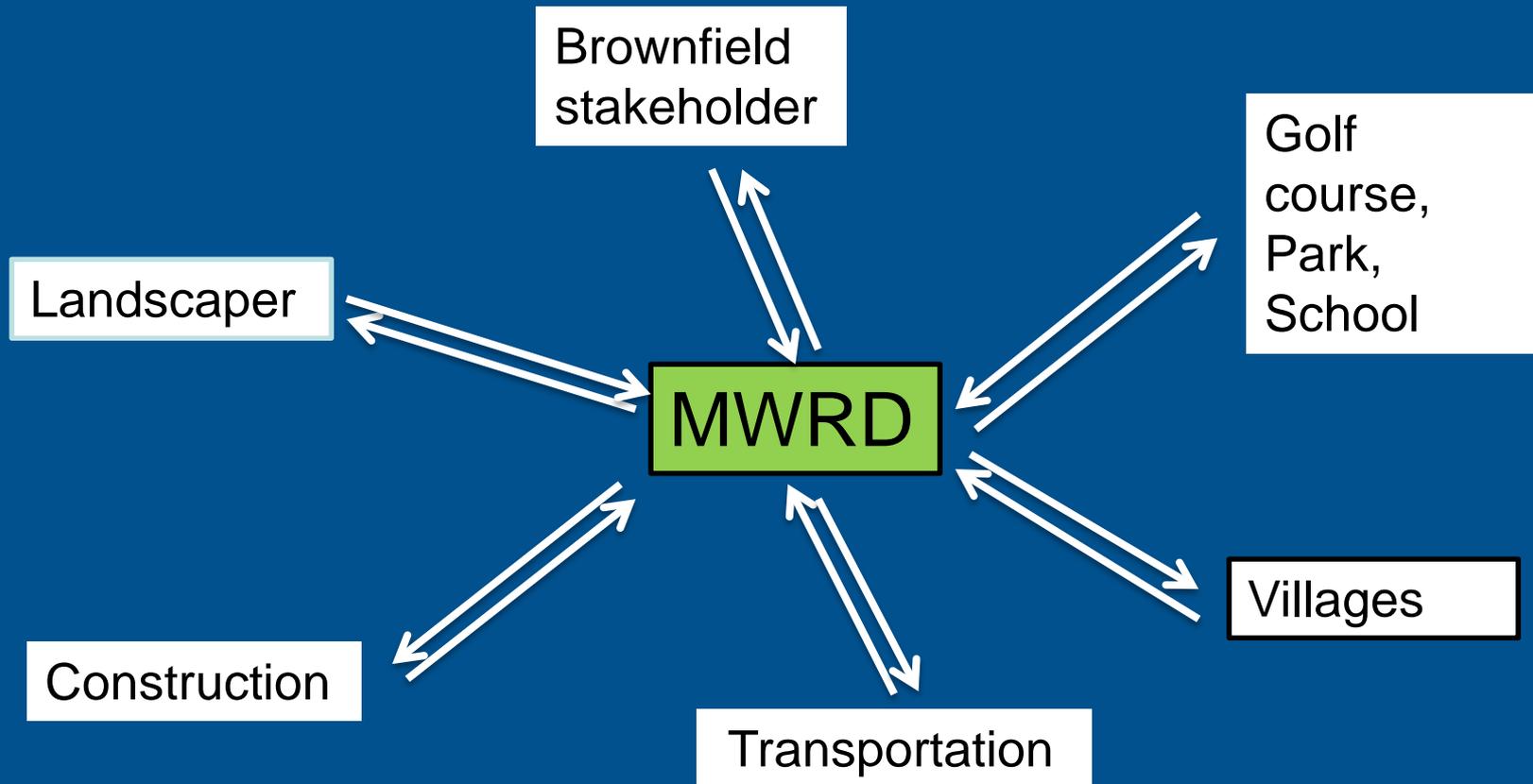


**Spread 1.5-inch composted biosolids and roto-till to 6-inch depth or  
Composted biosolids spread in flower beds**

**2-inch composted biosolids for revegetation**



# Networking of Biosolids/Composted Biosolids Utilization



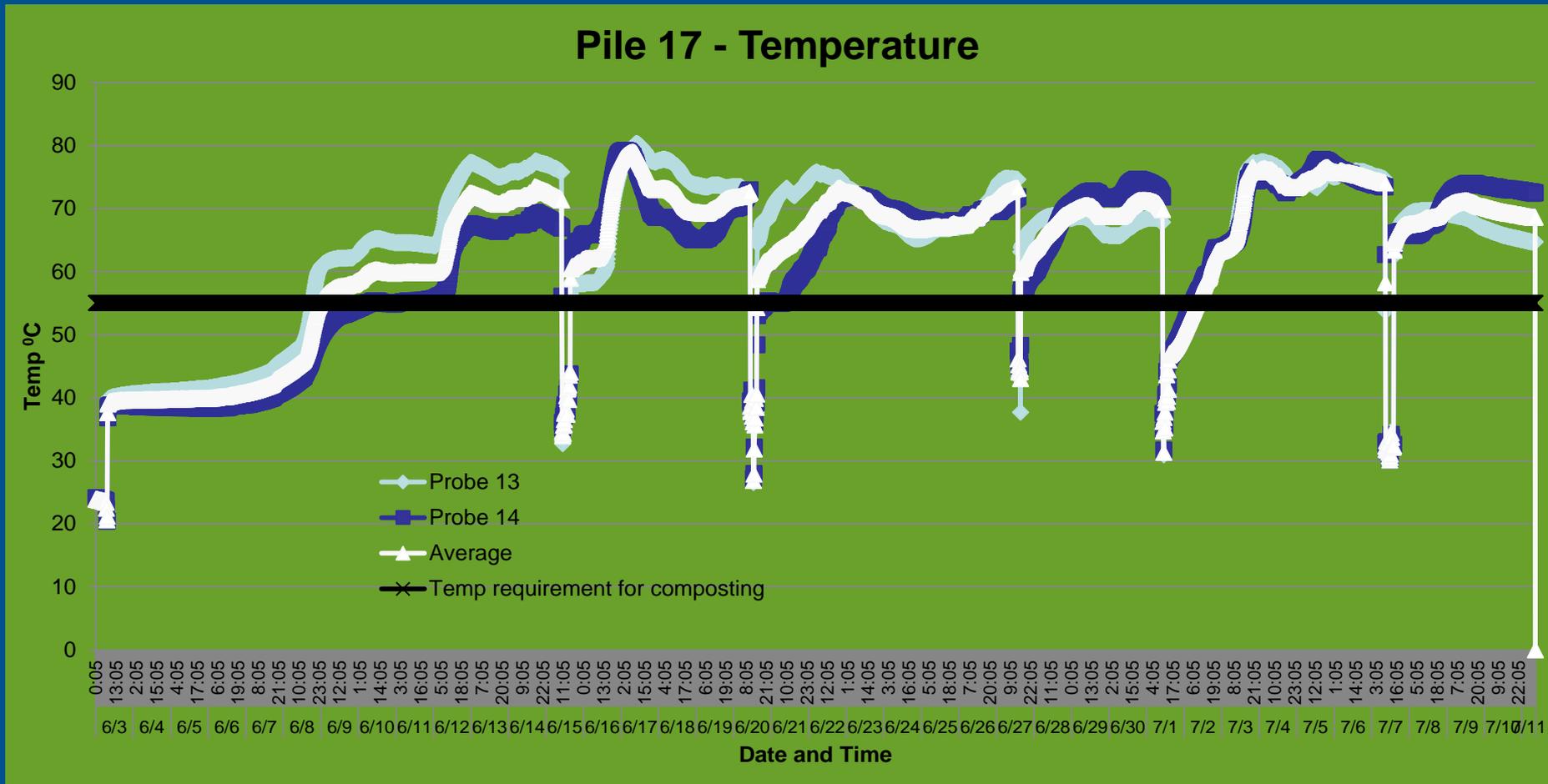
# Composting Temperature Monitoring

- Temperature recorded at 15 minutes interval, downloaded daily
- Part 503 requirement: Temperature @ 55° C for >15 days & 5 turnings



# Composting Temperature

- Over 65 piles already produced in 2016
- All piles composted met temperature requirements



# Composted Biosolids Quality Test

Key Parameter	Target Level
Stability	<2 mg CO <sub>2</sub> -C/g organic matter/day
Maturity	>80% seed germination
Odor degree	<5 on the scale of 1-10
Soluble salts	< 5 dS/m
pH	6-8
Trace metals	EQ limit
Fecal coliform	<1000 MPN/g

**Sampling after 16-week curing**

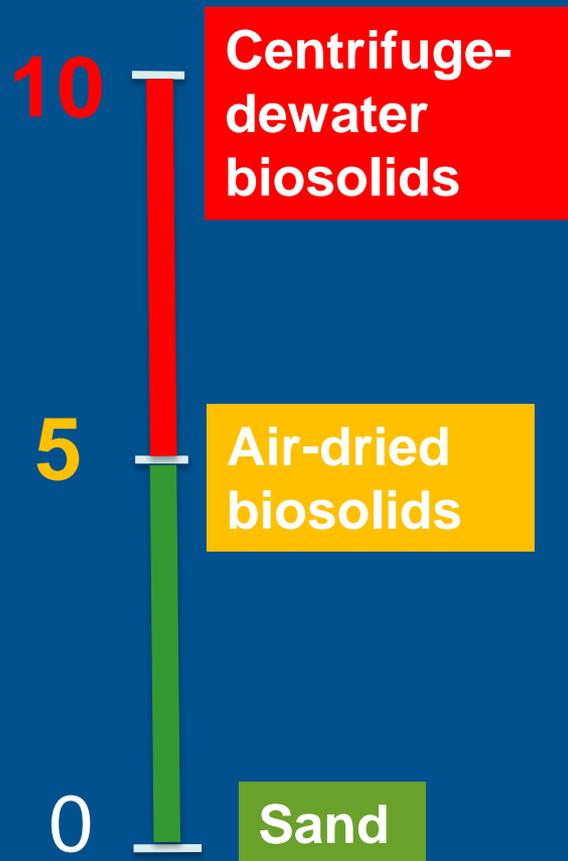
# Olfactometer - Composted Biosolids

- Have to “guess” which source has odor even under the highest odor concentration
- Odor generally below detection



# Direct Sniffing

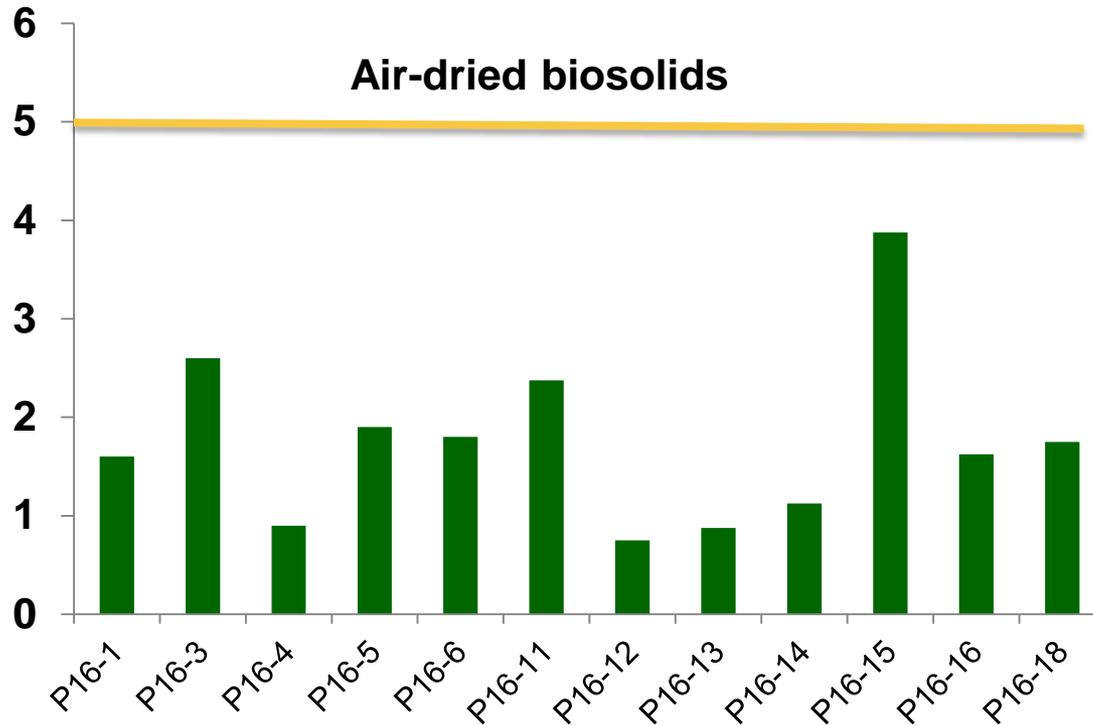
- Scale: 1 - 10
- Standard for odor rating



# Composted Biosolids Odor Evaluation

- Scale: 1 – 10
- Target level: < 5

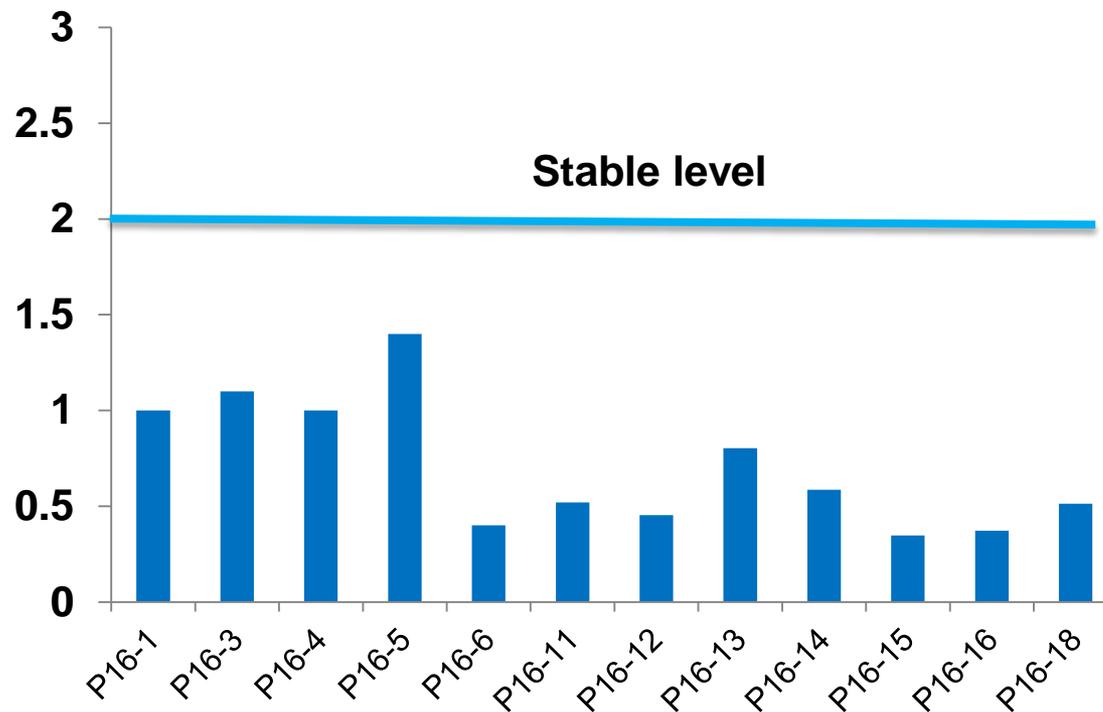
## Odor Rating



# Composted Biosolids Stability Test

- Stable:  $<2$  mg CO<sub>2</sub>-C/g organic matter/day

CO<sub>2</sub> Evolution (mg CO<sub>2</sub>-C/g organic matter/day)



# Compost Performance Test





## METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO



- Home
- Commissioners
- Departments
- Services & Facilities
- Public Affairs
- Media Center
- Business with Us
- Reports
- Employment

### Biosolids EMS for Biosolids

[Services & Facilities](#) >> [Biosolids Program](#) >> [Biosolids](#)

## Biosolids: A Sustainable Soil Amendment and Fertilizer



Biosolids are a product of wastewater treatment that captures the plant nutrients and carbon needed for healthy soils. Air-dried biosolids look and feel like dark, fine-textured retail stores.

Air-dried biosolids can be used almost anywhere lawn fertilizers are used, such as on turfgrass at golf courses, athletic fields, parks and other recreational areas, and for restoration projects. Air-dried biosolids can be used as any compost would be, as a soil amendment or conditioner for establishing turfgrass, for mixing into custom topsoil blends, and in planter beds and pots for establishing plants. The composted product actually improves the soil for plants, helping to increase water retention and promote root development. Better soil and healthier plants require less maintenance.

Metropolitan Water Reclamation District of Greater Chicago (MWRD) air-dried biosolids are dried on paved pads to achieve ~60 percent solids content at which point the biosolids are blended and co-composted with woodchips in windrows. At the MWRD, the composted biosolids and air-dried biosolids are generated by following U.S. Environmental Protection Agency's most stringent criteria for biosolids.

### Biosolids are safe

The MWRD biosolids meet the USEPA's 40 CFR Part 503 regulations, which are based on comprehensive risk assessments that are protective of human health and the environment. These regulations are based on scenarios of a person coming into contact with biosolids or food grown on land receiving biosolids. These scenarios include children ingesting biosolids, workers tending to their vegetable gardens.

MWRD has an exemplary biosolids management program. MWRD biosolids go through an extensive testing regimen to ensure each batch is of the highest quality. The MWRD has used biosolids on athletic fields at both public parks and schools in the Chicago area for more than 30 years.

### Latest Regulatory Development

On July 20, 2015, Illinois Governor Bruce Rauner signed legislation (Public Act 09-0067) that amended the Illinois Environmental Protection Act to recognize biosolids as a safe

# **Back to the District's Strategic Planning**

# Goal – Production of Composted Biosolids

## Objective

Co-compost biosolids and woodchips to produce a value-added and sellable product.

## Description

Achieve a higher level of sustainability within the District's service area.



IGA with the City of Chicago

- 2016: 48,000 CY of woodchips Utilized



New Woodchip and Yard Waste Program Ordinance in 2016

- Additional Resource Recovery
- Cost Recovery, Charge a tipping fee to receive feedstock and create a new revenue stream from the sale of composted biosolids.
- Sustainable Practice of co-composting yardwaste/woodchips with biosolids



Target Production

- 2016: 10,000 tons    2017: 50,000 tons    2018: 100,000 tons







64



# Lessons Learned

- Difficult to meet Class A pathogen reduction
  - Inconsistent/Uneven Heating due to poor mixing.
  - Clumps are always present (Pathogen Carriers)
  - Low %TS is too weather dependent
  - Labor Intensive
  - Cross Contamination
  - Slow screening process

# Current and Short Term Operations

- Raw Materials
  - Dewatered biosolids
  - Wood Chips – currently from City of Chicago
- Process
  - Blending ratio = 1:3 biosolids to wood chips by volume
  - Monitoring: temp probes with data collection
  - Active Composting – 23 days @ 55° C (5 turns)
  - Curing – 16 weeks
  - Quality control (stability testing)
- Final Product
  - Screening – just before shipping
  - Storage



# Proper Equipment



Windrow turner



High Volume Screener

# Long Term: Proposed Covered Composting Facility at CALSMA

## Specifications

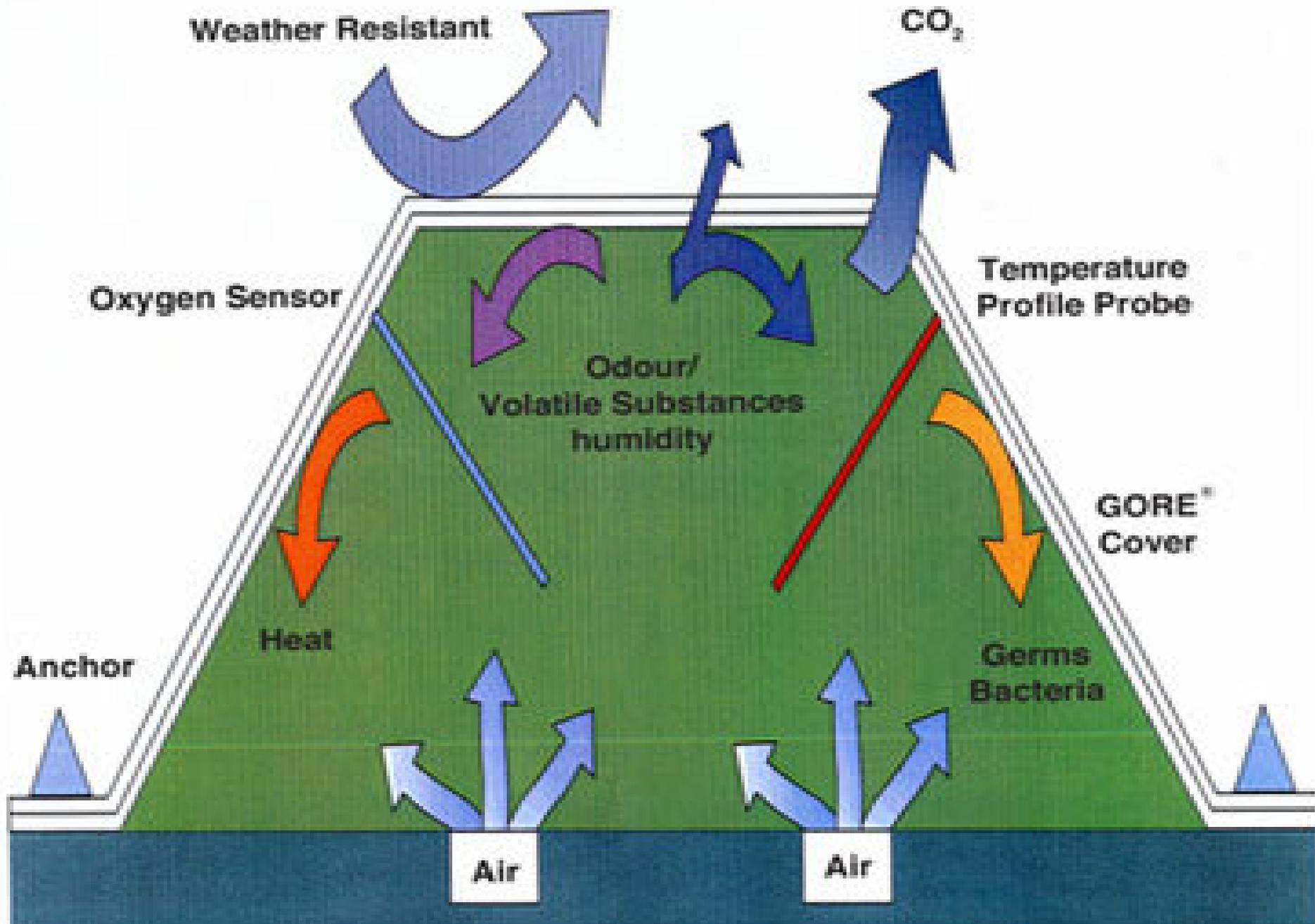
- 3-phase composting system using GORE® covers
  - Phases 1 and 2 – Active Aerated Covered Composting
  - Phase 3 – Cooling/curing (Uncovered)
- Capacity to process 25,000 dry tons of biosolids

## Process

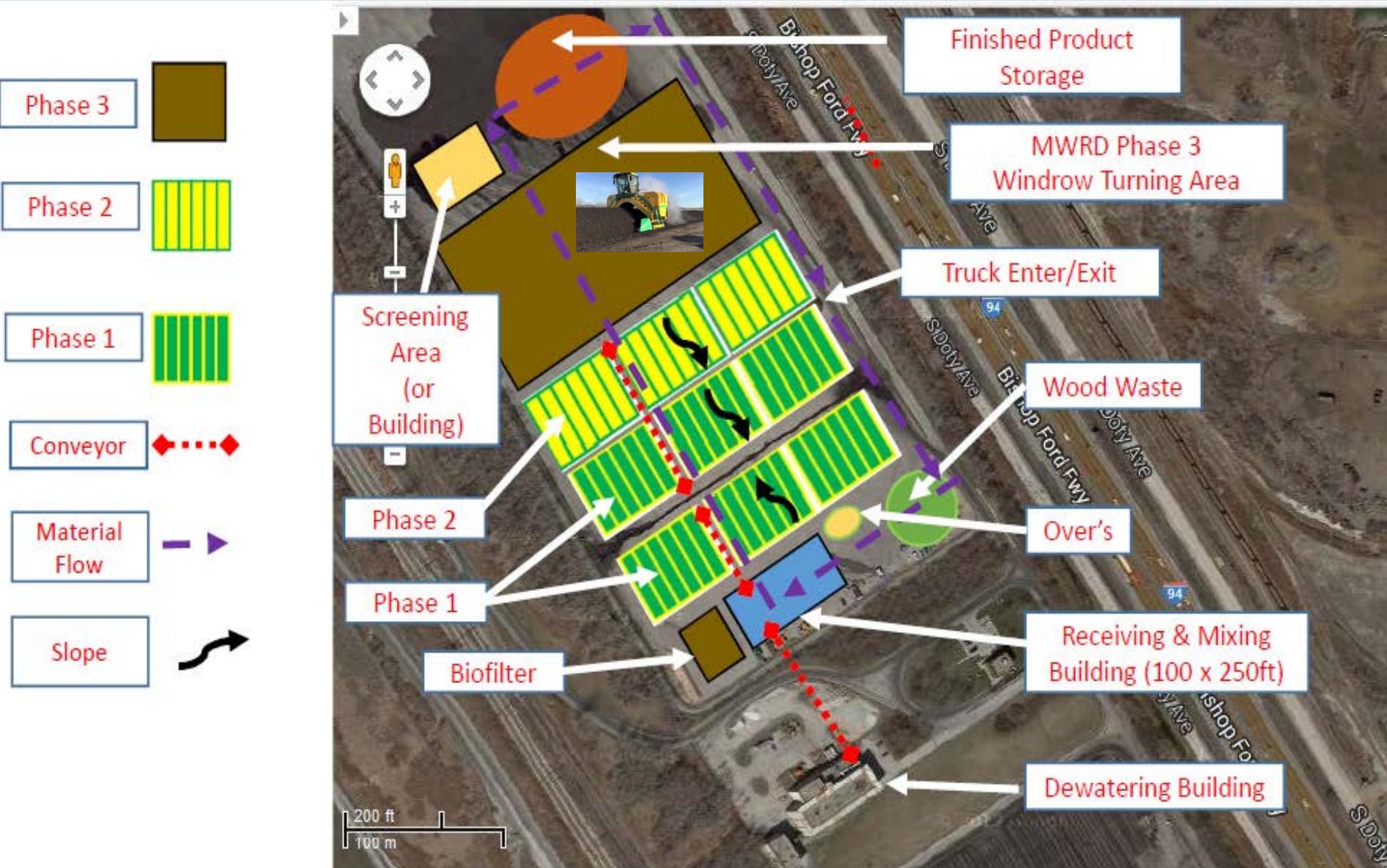
- 1:3 biosolids to feedstock mix ratio by volume
- 1 temperature probe per pile
- Necessary equipment includes mixers, loaders, screeners

## Final Product

- Testing not required if we adhere to the USEPA approved GORE® process
- Class A EQ composted biosolids



# Proposed Composting Facility at CALSMA





**i-Compost**  
 Version 1.3.6.408

HEAP 2000000000

T1 °C -8540  
 T2 °C -8530  
 T3 °C -8507  
 T4 °C -8858  
 T5 °C -8800

Hyg.

- Blower
- Oxygen
- Interval
- Failsafe
- Pressure

**Pressure**

Pressure (mmHg) 8240

Phase	Unit	Days	Batch
Phase 1	1A	000	00077
	1B	000	00070
	1C	000	00009
	1D	000	00073
Phase 2	2A	000	00007
	2B	000	00006
	2C	000	00005
	2D	000	00074
Phase 3	3A	000	00008



# Potential Compost Distribution

<u>Market</u>	<u>Application</u>
 Agronomic	Soil amendment, fertilizer
 Nurseries	Seed starter, container mix
 Landscaping	Topsoil blending, mulch, soil amendment
 Turf	Seed starter, topsoil blending
 Forestry	Mulch, soil amendment
 Land reclamation	Mulch, soil amendment
 Residential	Seed starter, topsoil blending, mulch, soil amendment
 Commercial	Landscape Suppliers: Retail stores (e.g., Home Depot)

# Community Gardens

-  ChicaGRO Intergenerational growing project. Turning vacant South Chicago neighborhood lots into backyard community gardens. (72 Gardens)
-  Hanover Park Tree Farm & MWRD Tree Sapling Program
-  Landscaping Beds and tree planting
-  Park Districts





## The Village of Midlothian

Applying compost for planting grass at a vacant lot in 2016.

A few weeks later...





# To Use Biosolids/Composted Biosolids

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## Call in Advance

Dominic Brose 708-588-3134; brosed@mwrdd.org

Wale Oladeji 708-588-4246; oladejio@mwrdd.org

## MWRD Technical Support

- Soil scientist will assist in filling User Information Sheet
- MWRD soil scientist can provide technical assistance in the planning of the use of biosolids/composted biosolids

**Thankyou  
and  
Questions?**